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ABSTRACT

This report presents a working model of how future images influence women's career decisions in science. Based on interviews with college women (n=18) who invested at least two years in college science, the nature and source of women's conflicting future images, or clash of future selves, when considering science careers is described. Women identified three kinds of clashes: (1) type of person; (2) lifestyle choices; and (3) purpose of science work. The source of these clashes was the discord between the images projected by people in the field and students' desired future images. Students questioned whether they were in the right field because they were unable to identify images that were consonant with their desired future images. Specifically, the students' positive image of being "collaborative" clashed with the field's negative projected image of being "competitive", the positive image of "combining family and career" clashed with the negative projected image of "being childless and unbalanced", the positive image of scientific work as "contributing to society" clashed with the negative projected image of scientific work as done "for the money or sake of science". In order to help them work through these conflicts, the students turned to others for mentoring. As a consequence, some students pursued other fields while others shifted to different careers within the field, and a few took steps to redefine the field through creative uses of mentoring. Implications for further research on future images and mentoring are discussed. Contains 16 references. (Author/WRM)

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Future images and women's career decisions in science

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Abstract

In this paper, we present a working model of how future images influence women's career decisions in science. Based on interviews with 18 college women who invested at least two years in college science, we describe the nature and source of women's conflicting future images, or clash of future selves, when considering science careers. Women described three kinds of clash: type of person, lifestyle choices, and purpose of science work. The source of this clash was the discord between the images projected by people in the field and students' desired future images. Students questioned if they were in the right field because they were unable to identify images that were consonant with their desired future images. Specifically, the students' positive type of person image of being "collaborative" clashed with the field's negative projected type of person image of being "competitive"; the students' positive lifestyle choice image of "combining family and career" clashed with the field's negative projected lifestyle choice image of "being childless and unbalanced"; the students' positive purpose of science work image of "contribute to society" clashed with the field's negative projected purpose of science work image of "for the money or sake of science." In order to help them work through these conflicts, students turned to others for mentoring. As a consequence, some students pursued other fields, while others shifted to other careers within the field, and a few took steps to redefine the field through creative uses of mentoring. Implications for future research on future images and mentoring are discussed.

Numerous researchers have investigated women's career choices in the sciences, and despite our increased knowledge, women are still underrepresented in science fields (Vetter, 1996). There is no evidence that students who leave differ from those who stay in terms of academic performance and effort (Seymour & Hewitt, 1997). In addition, while self-efficacy is an important factor for students to consider science, Farmer's model of science career pursuit which focuses on self-efficacy (Farmer, Wardrop, Anderson & Risinger, 1995) explained 97% of the career behavior in men and only 34% of the career behavior in women. This suggested that women may be efficacious in science but still leave the field. Similarly, Lips (1993) found that for women, science interests did not predict their perceived likelihood of pursuing a science career, whereas for men there was a positive relationship. Thus, academic performance, self-efficacy, and interest in science may be important, but not decive factors in women's career decisions in science.

Future Images in Science

Science identity, in particular, has a central role in girls' career decisions in the pre-college years (Baker, 1987; Baker & Leary, 1995), and it has a salient role in college when women report that they see themselves as "different" from the traditional scientist (Seymour & Hewitt, 1997; Stage & Maple, 1996; Tobias, 1990). A growing body of literature has documented the negative stereotypes of science (Harding, 1991) and scientists (Eisenhart, Finkel, & Marion, 1996). Science is considered a "nerdy, male, and White" occupation (Eisenhart et al., 1996), characterized by scientists' social isolation at work (Stage & Maple, 1996) and in their personal lives (Eccles, 1987; Holland & Eisenhart, 1996). According to this research, negative stereotypes consistently discourage girls and women from considering careers in science.

But, why would negative stereotypes influence individual career decisions? Students' future images can motivate their current career decisions as they work to

become certain desired possible selves and avoid other feared possible selves (Markus & Nurius, 1986). Using this "possible selves" perspective, these discouraging negative images of science professionals represent possible images for the student. These stereotypes are not necessarily accurate, nor part of any professional's actual identity, but nonetheless serve as visual approximations or "images" that students use to assess whether they can see themselves in a future career. One approach to examining the role of science identity is to explore students' future images of science and scientists and how these images influence their career decisions. This paper illustrates the promise of using a future-oriented perspective to understand women's career decisions in science.

One might wonder why any woman would pursue such a career with all of the negative images in science. In contrast to those women who never seriously consider science careers, it is likely that women who pursue science have images of science and scientist other than those depicted in stereotypes. They may have positive images of themselves being successful in science careers and enjoying the work. However, given the predominance of negative stereotypes in science, women who pursue science may struggle with the tension created by competing negative and positive future images, a tension we call a clash of future selves. This clash represents an important phenomena we aim to learn more about, for it can potentially influence the career decisions of women who have already begun to make an investment in the science field.

In a previous paper (Authors, 1997), we explored the idea of clash of future selves in interviews with 10 college women. In that exploratory paper, we described the nature of clash and made the claim that students' experiences of future-oriented struggles influenced their career decisions in science. In this paper, 8 additional participants are added to the analysis, the categories of clash redefined, and the source of clash analyzed. This analysis was used to develop a working model of how future images impact women's career decisions in science.

Research Questions

In this paper, we wanted to closely examine how future images impact women's career decisions in science and develop a working model of this process. In order to do this, we needed to understand the nature and source of their struggles and how these struggles impacted their career decisions. As a result, our research questions were:

1. What is the nature of women's clash of future selves?
2. What is the source of this clash?
3. How do students work through this clash?

Methods

Participants

Participants were 18 upper division (juniors or seniors) college women at a large midwestern university. Most were European-American (n=16), one student was Hispanic-American and one student was African-American. They ranged in age from 20 to 23.

Procedure

Students were recruited to participate in the study using two methods: 1) solicitation in higher-level courses, 2) letters sent to a random sample of students who had participated in college science or engineering for at least 2 years. Students were reimbursed a nominal amount for their time. Semi-structured interviews lasted approximately 1 hour and explored topics including: future images in science, role of mentors and role models, work-experiences, and science community. Interviews were analyzed for content-themes; specifically, we examined the nature of future images, sources of clash, and how students negotiated clash.

Results

Overview

First, we present the nature of clash across three major categories. Next, we analyze the source of clash. Then, we examine the different ways that women worked

through their clash. Finally, we discuss these findings and implications for intervention. At each section, we develop part of the model for how future images influence career decisions in science as grounded in evidence.

Nature of Clash

Three major categories described the nature of clash of future selves: type of person, lifestyle choices, and purpose of science work. Many students described more than one of these kinds of conflicts (for complete list, see Appendix A).

Type of person. This category referred to the kind of person they could become if they pursued a science career. Of the 18 participants, 13 described conflicts in this area. While students liked the challenge of the research, they could not see themselves as a stereotypical, white-coated scientist who did not work with people.

> I couldn't really see myself wearing a lab coat every day. You know, wearing my goggles every day. I didn't see myself going into the lab all the time. That was definitely a part of the reason why I decided to change. (Nicole)
>
> I liked the challenge of the research in the lab, but I needed to work more with people. I didn't like going into the lab and just staring at a gel running on a bench, I want to do something where I interact with people a lot more. (Autumn)
>
> I can't see myself you know maybe working in a lab by myself with these little vials and not connecting with people. If I could protect natural resources and work with people-- that is why I was interested in biology to begin with. (Elizabeth)

In these examples, Nicole, Autumn, and Elizabeth talk about the future images they had of what the future career would be like. These images included wearing goggles, staring a gel running, and working with little vials. Other students reported that while they were interested in science, personality of scientists or engineers was something they could not see for themselves.

> I found that a lot of people in corporate America were cut-throat. They all said the same thing. How can we suck the life out of you to make us better and stronger. I could not see myself in this little cubicle, doing something for this man and I'm doing all his work and he's getting all these promotions. (Ayisha)
>
> And if you have to step on Joe Schmo to make the grade, well that's okay. And that's just not me. (Kari)

> I hate doing that, people [in engineering] would all be schmoozing, and I am just not that type of person. (Alison)

Ayisha, Kari, and Alison described specific images of the future career: getting the life sucked out of her by cut-throat coworkers, stepping on other people, and smooth-talking on the job. These images of the future career turned them off and conflicted with the possibility that they might like careers in science or engineering. Other students were concerned that being a science person meant that one was consumed by her work and the very minute details in their studies.

> The research I am doing; I like doing it-- but there is something lacking. It is not hands on enough for me. I cannot see myself doing it for the rest of my life, at least not in this capacity, not how I see graduate students doing it. (Cameron)

> Where [marine biologists] have the passion for the whole thing, I just I like watching and observing. But the small details [like studying invertebrate zoology] you need to know I am not interested. (Betsy)

Cameron saw herself as a hands-on person and Betsy saw herself someone who was more interested in field work. As a result, both of these women saw themselves as different from the kinds of people who do science.

These examples illustrate that students had thought about the kind of person that they wanted to become and the discord between those images and the images they had of science people was conflict for htem. Whether or not these images of science people were accurate, they clearly had an impact on their future careers; students considered moving away from these careers which brought about conflicting future images.

Lifestyle choices. This category referred to the kinds of lifestyles one could choose. Many students were concerned about becoming mothers or having families in the future while pursuing their desired science career. Of the 18 participants, 13 described this kind of conflict. For one student, it was about her anticipated plans to marry and whether a scientist commits to her career or her partner.

> One day I just had this revelation that this was not for me. First I freaked out because this is what I've been looking at my whole life. But, I don't think I could ever be somebody who is married to their career. It's very important to me. I'm already with the person I'm gonna marry. (Helene)

For Helene, pursuing a career in science meant being exclusively commited to that career, something she did not see as a viable lifestyle choice. Other students described their concern about the major time commitment that would be required by pursuing a career like medicine which had a great deal of education. They were not sure whether a future family was reasonable with such a career choice.

> I just think medicine becomes your life...so you are looking at 12 or 13 years that you are devoting to medicine and not your family. (Kari)

> Everyone's always said you can't do both, especially in medicine. You can't [have a family and a career in science]. It's too demanding. My dad kept saying you can have a family, but you're gonna have to take ten or fifteen years to get to that point. But I don't want to sacrifice ten or fifteen years of my life to get to that point. It's not worth it to me. (Nicole)

Both Kari and Nicole raise their concern of a 12-15 year investment in the education before beginning a career because of how that would constrain their desire for a family. For others, they felt that the work of science careers required such long hours and commitment. As a result, they were not sure whether having family in the future was realistic for them.

> In terms of having a family and things like that, [my boss] is at the cutting edge of his field of research. I think you can't be that successful and at the same time have a family that you put a lot of time into. (Stephanie)

> I was thinking if I was doing this for real, I don't know if I could every day get up and work. I have had 90 hour work weeks before. The people I am with have families and they travel all the time, they have little kids and they hate it. (Jenna)

Both Stephanie and Jenna raise that pursuing careers in science would raise a conflict due to the demanding work week and the anticipation of having children at home. They did not want their future children to suffer because of their career. A few students highlighted that being a woman made them especially sensitive to this future concern.

> In addition, especially being a woman, I will feel demands from my family. I don't yet have a family, but I realize how much of a demand that is on my time. I want, for instance, my children to feel like they are my priority. And if I rush off every ten minutes for emergency calls or for whatever I need to do, they aren't going to feel that. (Selina)

> My professor said one day "I wasn't home for seven days and I came home and I felt that my children had grown three inches and I could barely recognize them,

> but I didn't really care. My wife was there the whole time taking care of them." (Suzanne)

Selina described a specific image of rushing off for emergency calls and the impact it would have on her future children and Suzanne described an image of children growing up in the care of the wife. For both of these students, being women made them especially concerned because they anticipated a great deal of the childcare responsibility. Other students were more concerned with having a well-rounded or balanced life and a career in science.

> I have these pictures of research people, when I work at the Science Building, there are some weird people. You know, they don't go home. I want to have my career and I want to have my life too. (Jessie)

> Sometimes if you go out late at night, there's lights on in the labs. I would not want to spend my weekends late at night or early in the morning doing research. I guess maybe if I had the opportunity, if someone had a project, I might get into it. But I wouldn't want to do it the rest of my life. (Shelly)

Jessie and Shelly describe their images of "science people" who are in their buildings late at night and on weekends. These images were in conflict with their future images of themselves having an outside life. These examples highlight the important value students placed on becoming married, having a family, or having an active personal life in the future. Students did not know if their desired future images were possible in the science field given their perceptions of the time and commitment required by those careers.

Purpose of science work. This category referred to how one would use their work in science, for example to contribution to society or for personal gain. Of the 18 participants, 4 described a conflict in this area. These students didn't want to "sell out" for money or do science just for the sake of it, they wanted to contribute to society.

> I had this email relationship with this man. And essentially, my biggest concern about environmental science was if I would have to ever sell out my like beliefs and morals, for money. Because I saw myself working for a non-profit organization and max salary would be like $30,000 and I didn't have a problem with that. Until I started talking to him, and he said "I was just like you. I had these headstrong ideas about saving the environment and not letting the government do the things that it does." And now he works for the government, finding the loopholes in the laws that were made to save the environment so that the government can destroy it. And I had a pretty big problem with that. (Suzanne)

> I thought about going into plants for a while, but it didn't seem like it did anything. I work in a lab now and it seemed like you were working on all this stuff but it doesn't seem to apply to anything, but with human genetics it helps, in gene therapy, in my lifetime I could see something go right and in forensics it would be an everyday thing that actually helped. (Dawn)

Suzanne and Dawn had views of why they were pursuing science work. They wanted to help others and society through their work. However, these desired future images seemed to be in conflict with the images they had of other scientists who were in it for the money or for the sake of doing science research.

In summary, students described a variety of future images of science work and scientists and the conflicts they raised with their own desired future images. None of these women were actually in a science career yet, and none of these women were married or had children yet. However, their anticipated lives and their values for the future career were important to their current career decisions. Their future images were salient factors when considering careers in science. While there may be other concerns, these students' future images and related conflicts fell into three main categories: a) type of person, b) lifestyle choices, and c) purpose of work. Figure 1 illustrates these three categories and students' desired future images.

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Insert Figure 1 about here

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Source of Clash

In reading about students' concerns about the future, there was a definite discrepancy between students' desired future images and their perceptions of the possibilities in the field. When thinking about what kind of person they imagined becoming, students could see themselves as collaborative, social, supportive, and genuine people, but described others in the field as cut-throat, "schmoozing", white-coated people. When thinking about their future lifestyles, while students could see themselves as combining aspects of personal and professional life, they described others

in the field as not putting time into their families and not being well-balanced. Further, while they imagined being in science in order to help others in society, they described people in the field as using science to learn for its own sake or for the money. These descriptions suggest that the source of their conflict was "the field"-- a homogenous, unchanging manifestation consisting of images projected by people in their environments. That is, rather than an abstract conception of what science people do, students were looking around at a person or people in their environments to inform them of what the field was like and what possible images there were for them.

The larger the discrepancy between their desired future images and the field's images, the more intense the "clash" they experienced. Many students reported that their desired future images did not exist in the field or at least were not consonant with the images they saw in the field. In the previous section, students remarked phrases such as: "everyone says", "you have to", "the way they do it" which illustrate their view of the field having rules of how to be. In one way, students' perceptions of the field are grounded in real experiences since they are based in the lives of others. However, their perception of the field was largely influenced by how much of the field they knew about both in terms of people and kinds of settings or contexts. Thus, their perceptions of an unbending, unchanging field may have been intensified in three respects: the few of female images they encountered (especially in academic environments), their lack of exposure to multiple images and settings in the field, and the lack of clarity students had in their desired future images.

Few female images. Students lamented about the few female images in their environments and the lack of future images consonant with their desired future images. For example, one student explained why this was important to her.

> Another factor for why I chose not to do this is I didn't know any women personally that had that balance [between career and family]. But maybe if I had met a woman that had the balance I could have stayed more focused. (Suzanne)

Similarly, another student described how knowing only one woman and her frustrations led her to think the field was not for her.

> She is a person having the type of lifestyle that I would want, but I see the other people in science don't have the same lifestyle that she does. I see that difference between her lifestyle and everyone else as what science is about and why she is so frustrated with it. (Stephanie)

This led students to look even harder for evidence that there were different images in the field. They were often disappointed given their limited access to multiple images, especially when they were making critical decision to stay or leave the field.

Homogenous nature of images. For the most part, students perceived that the images in the field were homogenous in nature. While some might think that certain kinds of people gravitate towards these fields and therefore science is not "for them", other students perceived that the field had the power to transform them into certain ways of being. For example, one student talked about not wanting to turn into the people she saw in her environment.

> I want to give engineering a chance. But if I turn into what those people are after 5 or 7 years, then I am going to do something else. Because it is not worth it. You know? I don't care how good the money is or how it's not or what the hours are. I worry about losing the fun side of myself, or having fun or being goofy or immature. I don't want to ever lose that in being serious or technical. I see how easy it would be to get caught up in everything and lose sight of who you are and what you wanted when you first started. (Jenna)

For Jenna, others gave her an image of being unhappy, serious and overworked, an image that she did not want to become in the future. Her description of "turn into what those people are" implies that the field has power to transform someone negatively, and given the lack of exceptions, she had little reason to question this.

> Part of the reason why I chose vet school is I'm looking at the grad students and I am thinking, I don't want to be 28 years old and still trying to get my Ph.D. in biochemistry. (Cameron)

> What I found is that you could find role models if you wanted to go into any field of corporate America or any type of automotive field. I realized after that first year I did not want to go that route. (Ayisha)

In their descriptions, students explain that it was not so much the lack of female images, but the perception that everyone in the field was the same-- and specifically that this homogenous image did not map onto their desired future image.

Lack of clarity in one's future image. Students reported a lack of clarity in seeing their own desired future image. Not being able to see themselves in the future encouraged students to look harder for images in their environments to emulate, and then to become frustrated when they could not find them.

> A lot of times it's not always real clear to see-- get a picture of what you're gonna be doing...When I was in science, it was like my vision of myself was really cloudy. Like I couldn't really paint a clear picture of what my life might be like or what I was actually gonna be doing. That made it really hard for me to decide whether or not to pursue it because I'm like, what if this is totally wrong for me. (Helene)

Helene, like other students, struggled to imagine future images for themselves in their future careers. It was difficult to do so when they aimed to imagine alternative images to those in their environments. In summary, students were concerned about the future. How could they become something they did not see in the field? This aim was complicated by the limited access students had to multiple images in the field and the lack of clarity they had in seeing their own desired future image.

Figure 2 illustrates how the clash represents a conflict between the student's desired future image and the field's projected image. The field is represented by people, whose projected images are a part of the field's images. In the diagram, the student's positive type of person image of "collaborative" is in conflict with the field's negative projected type of person image of "competitive", as represented by A+ and A-. Similarly, the student's positive lifestyle choice image of "combining family and career" is in conflict with the field's negative projected lifestyle choice image of "childless and unbalanced", as illustrated by B+ and B-. Finally, the student's positive purpose of science work image of "contribute to society" is in conflict with the field's negative projected purpose of science work image of "for the money", as illustrated by C+ and C-.

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Insert Figure 2 about here

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Negotiation of Clash

Students wanted to work through these conflicts. They did this in a variety of ways; each was influenced by the access they had or perceived to supportive people and desirable images. A cautionary note: The paths described in this section are in no way random and are influenced by the recruitment procedures (e.g., many students choosing education paths, half leaving the sciences). However, they do represent three possible paths: leaving science for another field, shifting branches within science, and staying in their desired field (see Table 1).

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Insert Table 1 about here

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Pursuing other fields. Of the participants, 9 students became frustrated with the lack of mentoring and desirable images within their field. These students gravitated to other fields. For example, one student was discouraged by her advisor in biology and was encouraged by her sister in education.

> The change really came when I went to my advisor and he discouraged me from continuing with my career plan. And, at this point my sister was in the program in the education school. She said the applications are due in a week, why don't you just fill one out, and see how you do? (Betsy)

Another student was similarly was disillusioned with the engineering field and was pleased to find people similar to her in the teaching field.

> I try to take things day by day, but, my family, my friends, my boyfriend, offer support or help. If I can't take care of something myself, I can turn to them. My boyfriend, he was supportive when I changed my major. He wasn't mad. He said, 'Allison, I can tell you aren't happy, I want you to do what makes you happy.' He knows now I am very happy [in teaching]. (Allison)

One student described how her science advisor encouraged her to go into another field. She was then pleased to have the support of an advisor in health education who helped her see herself in a future career.

> I went to see my advisor, and my advisor said, "you know the class load is heavy. Maybe you're not a math/science person." I'm not a math person. I'm a science person but I didn't understand why I wasn't getting it. She said, "Why don't you try the business college? Be in it from a financial standpoint?" Then, a health educator helped me with courses. She helped me pick [courses] and they really helped me visualize what different routes I could take and what to do after undergraduate. (Nicole)

One student's possible mentor in chemistry discouraged her from continuing in the field with reasons that confirmed the worries she had about family and career.

> My professor talked about the negatives of research. He talked about how his wife used to get upset with him when he'd have to spend three nights in a row at the lab because he had to do all these tests. And he posed the question to me, do you really want to do this if you plan on having kids? I didn't want to have my life be in the lab. And I thought that is how he said it was going to be. And so, I made a definite snap decision. I emailed the professor and I said, I hate to tell you but I'm going to be a teacher. I'm not going to do research. He emailed me back and said, I understand...I knew a few months ago that you shouldn't be a researcher. You're not going to have as fulfilled of a life doing that as you would being a teacher. And I agreed. (Suzanne)

In all of these examples, people in the students' environments agreed that students may be happier in another field, and supported their move to another field more harmonious with their desired future image. Betsy's sister in education, Alison's boyfriend, Nicole's advisor in health education, and Suzanne's professor in chemistry all supported their move to a field where they could find images consonant with their desired future images. In fields such as health education, teaching, psychology, and communication, students found several different female images and lifestyles and personalities they identified with. These included friendly, family, and helping images which were consonant with their desired future images.

Finding a match in science. Of the participants, 6 students were fortunate to find examples and strategies from mentors within science who supported their belief that they could be who they wanted in the field. While they initially considered careers in particular branches of science, these students found a home in another branch of science.

When these students doubted if they were in the right field, mentors helped provide visions of possibility, either through their own example, or through strategies and support. One student who was worried about balancing career and family found a positive image within medicine through her mentor.

> There are enough family physicians that all take call, so that she gets several weekends off a month. And she said typically if you work in a group like that you can get time off. (Autumn)

The strategy and example of Autumn's mentor helped her envisions such a career for herself and stay within the field. Similarly, Stephanie's father represented a positive image she could look to and guide her forward.

> I worked with father when I was in high school a little bit. He has a family practice, he works entirely by himself, it is like a privately owned business. He has a lot of interaction with his patients and also with the community so that is appealing. I think the time you put in [in medicine], you are rewarded for financially. So you can lessen your load, you have control over that, and outside pressures aren't so much. I really see control as how to balance things. (Stephanie)

Stephanie's father offered an example of how hard work is balanced with pay, and can help offset the costs of daily living, childcare, and so on. In summary, some students were able to find people who represented possible images for them. This match for them, through example or advice, represented that they can stay in the field. Professionals in science created a vision that these women could make it in science careers, too. Despite the dominant images of perfect, isolated, or childless "science people" in their environments, these mentors suggested that the students could connect to them or that there were alternative paths possible. Their mentors, by virtue of being part of the science community (broadly construed) provided images of possibility and opportunities to negotiate clash in ways that allowed them to stay in the sciences.

Redefining the field with creative uses of mentoring. Of the participants, 3 students redefined the field they were pursuing. They did not find their desired future images in the field they were pursuing, but creatively combined mentoring from various people to help them pursue their desired future image. Others found mentors in field by

shifting fields within science or making do by creatively assembling the available mentors and images in their field.

> One of the ways in which I seek to overcome [barriers] is to look at someone who is already there. That tells me two things at least. It tells me a) that it can be done. Someone can do it. It has to be someone somewhat like me in some way, otherwise, you know, well, they can do it but why can I do it because of that? Well, because they're also a woman, or they also have a family or you know, their liability level. The other thing that it tells me is how they did it. And to some extent, can implement those techniques in my own life. (Selina)

Selina did just that, by talking to doctors in her work setting. Her boss, a doctor, was very supportive her and her mother provided an image of combining career and family. Another student described this combination:

> I think I've had in my life several people in my life who have filled partial roles of a mentor, but I don't think I've had anyone who has fulfilled all of the roles of a mentor for me. I'll just give you an example. My sister is a mentor in one way, she had a career and then a family -- she had an awesome career and an awesome family, so she had the best of both worlds. The honor's professor-- he was a mentor in a way because he had all the knowledge about majors and the different resources and getting things put together and so he would take my hand along in figuring that stuff out. (Maureen)

Maureen was able to draw from her sister as an example of the lifestyle she wanted and as someone who has a high-powered career, but not in science. Then she was able to take her professor and guide her toward what she specifically needed to do academically to get to where she wanted to go. Jenna also made use of the models she had available.

> Technically [my boss] is not an engineer...The things I try to take from him are his people skills. Those are the types of traits I would want to have when, if I were ever to be a manager--to have my technical background but not be so frigid to people and cut-off. I am trying to pull from everybody...Like that guy at my other company. He was really good as far as knowledge, but I didn't agree with the way he handled himself. I would take from him what I could and I learned a lot technically. But from [my boss], I am learning the other side and I am trying to put the two together. (Jenna)

Jenna was able to draw from her boss who was technically not an engineer and her co-worker who was in thinking about becoming a people-person type of engineer. These students did not find exact matches for them in the field, and they also did not go to other fields. They creatively used mentoring they had available to construct a "composite mentor image" and to imagine new images in the field.

In Figure 3, the different paths students took to work through their conflicts are illustrated. There is a connection between the available images in their environments and their choices.

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Insert Figure 3 about here

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Discussion

Future images and the clashes between them influenced students' decisions about pursuing science careers. These images were grounded not only in stereotypes but rooted in the images of people in science around them. These women were looking for alternative images, ones that could help them negotiate clash, stay in science, and pursue their dreams. As a result, women primarily moved from nontraditional abstract sciences to more applied, health-related sciences in their career aspirations. This study suggests that future images do influence women's career decisions in science and that clash is a complex and important phenomena for further study.

This study was limited to a relatively small sample of Euro-American midwestern women. It is possible that clash could be intensified in the experiences of women of color and first generation college-goers for they may identify even fewer images that are consonant with their desired future images. Future research can expand this line of inquiry and explore this working model with other individuals in different contexts. Expanding the focus of inquiry to a more diverse population may reveal additional kinds of clash of future selves and different strategies for managing clash.

Most of the images of science held by students - positive and negative - are based in reality. The clash they experience as they consider their futures is hardly an imagined tension. Science careers do tend to consume one's life, work is often isolating, and some sacrifices must be made. Similarly, even in the best cases, clash is merely managed, rather than resolved. Given this reality, two issues emerge for further

research and discussion. First, the number of women who are successfully managing their clash is small and growing only very slowly. Thus, the majority of images and mentors available to college women are likely to be individuals who are still in the midst of an intense struggle with competing selves. How then, can college women connect to the "positive" images across time and place, and how can they learn from the "imperfect," yet, real images around them?

One possibility is to conceptualize mentoring as a structure including multiple mentors and with the purpose of supporting the student's desired future image. This "composite mentor" approach was used by a few of the participants and appeared to be a productive strategy. The composite mentor strategy can communicate to students that alternative images are possible and that one can use the combination of "imperfect" models to support one's future image. Research is currently on-going in this area (Author, 1998) and will help to identify the effects of different mentoring approaches on students' struggles with clash. In addition, science educators and program developers can help introduce students to a range of images of men and women in science fields.

Second, clash has been portrayed as largely an internal personal struggle typically managed by the individuals themselves. However, it may be more productive to see clash as an issue that institutions as well as individuals, have the power and responsibility to manage. Yes, individuals can change, but we need to also consider how the field needs to change as well so that it no longer perpetuates an image that serves to push away a large, diverse groups of capable, motivated individuals. A field resistant to change may send a message of impossibility rather than possibility to students who see themselves as different from the modal images of science professionals. It will take combined efforts at the institutional, family, and individual level to strengthen our support and retention of women in the science.

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Appendix A: Nature of Clash (1=type of person, 2=lifestyle choice, 3= purpose of science work)

Name	Nature of Clash
Jessie	1, 2
Cameron	1, 2
Autumn	1, 2
Dawn	3
Stephanie	1, 2
Jenna	1, 2
Selina	2
Maureen	2
Ayisha	1, 3
Betsy	1
Kari	2
Alison	2
Shelly	1
Elizabeth	1, 3
Suzanne	2, 3
Leigh	1
Nicole	1
Helene	1,2

Table 1: Status of participants

Name	Status
Jessie	Considered research, pursuing chiropractics
Cameron	Considered research , pursuing vet. medicine
Autumn	Considered genetics, pursuing medicine
Dawn	Considered plant biology, pursuing genetics
Stephanie	Considered research, pursuing medicine
Jenna	Pursuing environmental engineering
Selina	Pursuing medicine
Maureen	Pursuing medicine
Ayisha	Pursuing engineering
Betsy	Considered marine biology, pursuing ele. education
Kari	Considered medicine, pursuing sec. education
Alison	Considered engineering, pursuing sec. education
Shelly	Considered research, pursuing sec. education
Elizabeth	Considered environmental science, pursuing English
Suzanne	Considered chemistry, pursuing ele. education
Leigh	Considered vet. medicine, pursuing environ. law
Nicole	Considered medicine, pursuing health education
Helene	Considered medicine, pursuing communications

Figure 1.

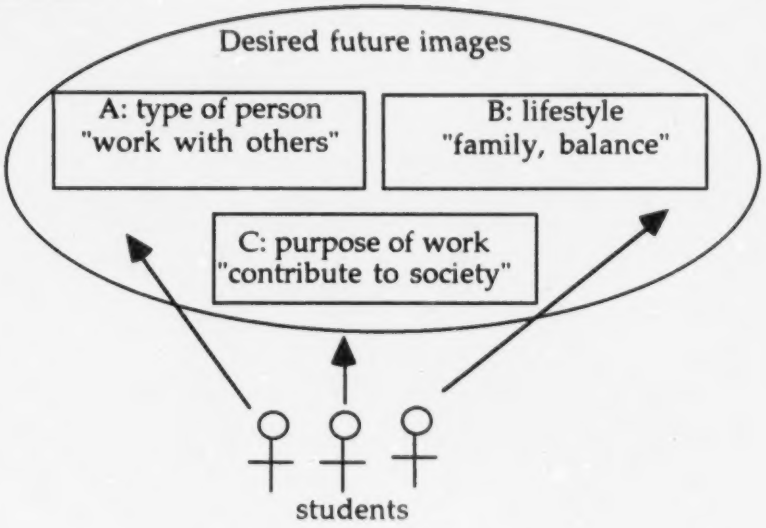
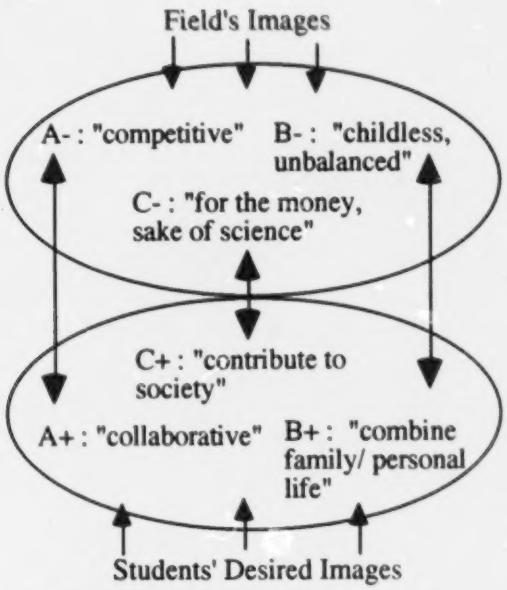

Desired future images
A: type of person
"work with others"
B: lifestyle
"family, balance"
C: purpose of work
"contribute to society"
students

Figure 2.


Field's Images
A- : "competitive"
B- : "childless, unbalanced"
C- : "for the money, sake of science"
C+ : "contribute to society"
A+ : "collaborative"
B+ : "combine family/ personal life"
Students' Desired Images

A: Type of Person
B: Lifestyle Choices
C: Purpose of Science Work

Figure 3.

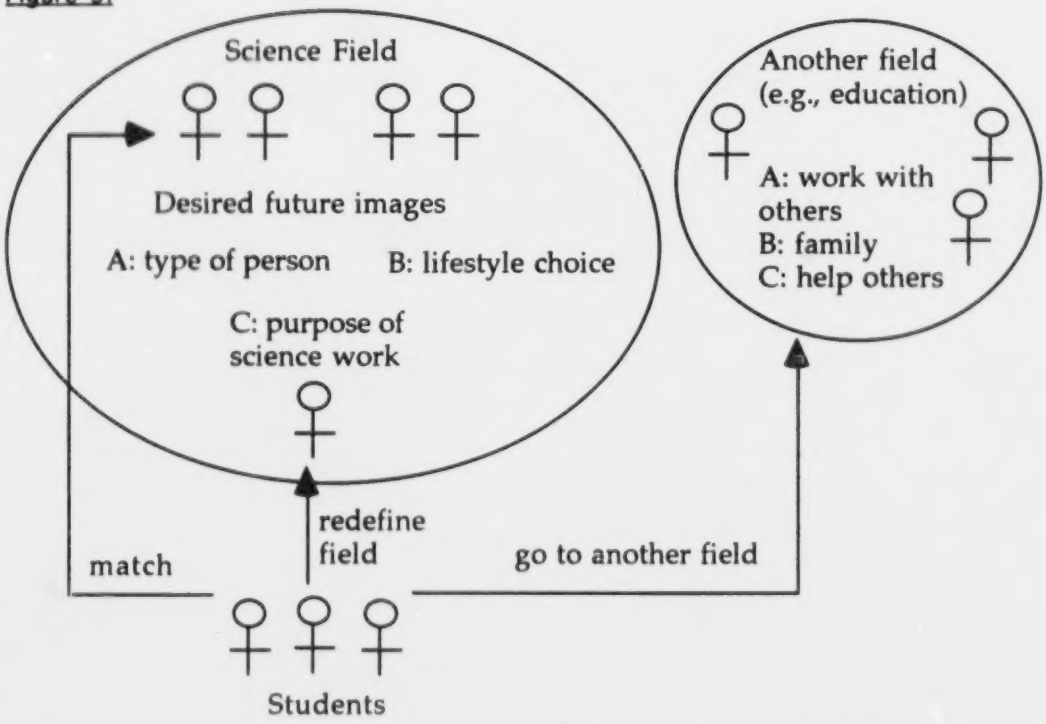

Science Field
Desired future images
A: type of person
B: lifestyle choice
C: purpose of science work
Another field (e.g., education)
A: work with others
B: family
C: help others
redefine field
match
go to another field
Students

Figure Captions

Figure 1. Nature of clash

Figure 2. Source of clash

Figure 3. Impact of negotiating clash on career decisions